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MONDAY, NOVEMBER 12TH, 1855.

THOMAS ROMNEY ROBINSON, D.D., PRESIDENT,  
in the Chair.

EDWARD WRIGHT, LL.D., was elected a Member of the Academy.

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Dr. Petrie having, at the request of the President, reported the donation, by Mrs. Thomas Moore, of the Library of the late Mr. Moore :—

On the recommendation of the Council, it was Resolved, by acclamation :—

That the marked thanks of the Academy are due and are hereby given to Mrs. Moore, for her liberal and important donation to the Academy.

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The President announced to the Academy that the annual Parliamentary grant had been increased from £300 to £500 per annum.

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The Secretary to the Council read the following papers :—

On the Early Discovery and extensive Adoption of the Bissextile Intercalation; with a view to determine the nature of the ancient Year. By the Rev. F. Nolan, LL.D., F.R.S.

After some general remarks on the natural division of the year by the vicissitude of the seasons, the difficulty which the author aims at removing is stated. The hypothesis of those learned persons who have laboured to prove that the ancient year consisted but of 360 days is first described, and some objections to which it is exposed are specified. The antiquity and general reception of the quadrennial intercalation is then asserted, and declared to contain a refutation of the false assumption that a year of such limited dimensions could have

been employed, by the ancients, for practical purposes. The facilities supplied by the Julian Period, which Scaliger brought into the service of chronologists,—as determining the place and nature of the quadrienniums of the Julian year,—are then insisted on, with a view to the establishment of a standard, by a comparison with which the modes employed by different nations in intercalating the year may be estimated.

For the attainment of the object at which the author aims, he proceeds to distribute his subject into three parts; respecting:—1. The use and antiquity; 2. The order; and 3. The intercalation of the quadrienniums as employed in the equation of time by the principal nations of antiquity, which he regards as the Egyptians, Greeks, and Romans.

1. In this order the Egyptians are considered in the first place; and the authority of Manetho is cited to prove that they discovered the mode of intercalating the year as early as the time in which the dynasty of Phœnician shepherds governed the country. This statement is corroborated by Censorinus, who identifies the small canicular cycle with the quadriennium, of which he describes the length and intercalation. Occasion is thence taken to show how the small cycle of four years was determined by the heliacal rising of the star Sirius; and how the great cycle of 1460 years was constituted of 365 lesser cycles or proper quadrienniums. From the high antiquity of the great canicular cycle, that of the quadriennium, on which it was founded, is concluded.

The transmission of the quadriennium from the Egyptians to the Greeks is then traced, and exemplified in the Olympiads, which are proved from Censorinus to have consisted of quadrienniums properly intercalated. From the various traditionary and historical notices of these cycles, from the times of Iphitus, and previously, it is shown that they were used by the Greeks above 900 years before the Christian era.

From the observations which apply to the solar year, it is then shown in order, that according to the quadriennium,

thus generally adopted, the lunar cycles, devised by the Greeks, for measuring the course of time, were constructed. Conformably to the principle, it is shown, that from the shortest of 8 years devised by Solon, to the longest of 304 years devised by Hipparchus, they consisted of a succession of complete quadrienniums, and ended in an intercalation. The exception of Meton's cycle of 19 years is considered; and evidence is produced that even in it the quadriennium was not disregarded.

To the Romans the use of the quadriennium is traced after the Greeks, and exemplified in the lustrum; the antiquity of which is inferred from its institution by Servius Tullius, about 580 years before the Christian era. Having shown, from the testimony of Ovid, that the cycle was a quadriennium properly intercalated, the author passes to the reformation of the Roman calendar by Cæsar, and shows that his principle, which remains in use among ourselves, was adopted from the times of Cn. Flavius, by whom it had been divulged about 304 years before our era.

2. The author, after inferring from the preceding observations the establishment of the first point of inquiry, proceeds to the second, in which he undertakes to show that the quadrienniums thus used by those ancient nations preserved the order which they hold in the Julian Period. In commencing with the Egyptians, he first considers the constitution of the great canicular cycle as composed of a succession of the smaller cycles, and as previously shown by him to be proper quadrienniums. From the construction of the fixed year, by which the vague year of the Egyptians was superseded at Alexandria, B.C. 25, it is first shown that its quadrienniums exactly coincide in order with those of the Julian Period. The same result is deduced from a rule given by a scholiast on Theon, for determining the epoch of the great canicular cycle. While it is founded on a computation of the quadrienniums which composed that cycle, it ends in tracing its first year to that of the corresponding quadriennium in the Julian

**Period.** An error of circumstance in this computation is corrected, in a comparison of it with that of the proper epoch, and the same result is established ; from which it appears that the order of the quadrienniums in the Egyptian cycle is precisely that which is assigned to those of the forementioned period.

In proceeding to consider the usage of the Greeks, the author commences with disposing of a difficulty which arises in identifying the Olympic years with the Julian, in consequence of the one having commenced in July, and the other in January. After pointing out the manner in which this difficulty admits of correction, he proceeds to show how the Olympiads are thus reducible, in their order, to the Julian quadrienniums, to which they in effect conformed. Commencing with the first year of the first Olympiad, he thence concludes that what is true of it necessarily applies to all those Olympiads which succeeded. From the solar distribution of the year he thence turns to the lunar, and shows that the cycles in which the latter was equated were accommodated to the Olympiads. Having exemplified this point, in the oldest cycle composed of two quadrienniums, he proceeds to the cycles of Cleostratus and Harpalus, which he shows had their first year coincident with the first year of the Olympiad. The same observation is shown to extend to Meton's celebrated cycle, although its distribution into quadrienniums was disregarded by that astronomer with a view to its accommodation to the lunar revolutions. By Calippus, however, in his improvement upon Meton, the principle for which the author contends is fully recognised, his celebrated cycle of 76 years having been distributed into complete quadrienniums, and having its first year coincident with the first year of the Olympiad.

From the reformation of the Roman Calendar by Cesar, a correspondent result is deduced ; the quadrienniums, as determined by him, having been necessarily identical with those of the Julian Period. This point is established from an investigation of the first year, which commenced with the epoch of

the reformation, and was that succeeding the consulship of Cesar and Lepidus. On being reduced to its proper place in the Julian Period, and its position in the solar cycle determined, it is found to be the first year of its sixth quadriennium; and, thus coinciding with the epoch of the Julian years, numbered from it in succession, it necessarily determines the quadrienniums derived from it to have been of the same character.

From the account of Cesar's reformation an evidence is deduced of the antiquity of the order assigned in his Calendar to the quadrienniums, as corresponding with those in the Julian Period. In tracing the usage to the times of Cn. Flavius, by whom it was divulged in the consulate of P. Sulpicius Severus and P. Sempronius Sophus, the author shows that it preceded, by 259 years, the date of Cesar's reformation. An example is thence elicited from Livy of the intercalation of the lustrum in the year B. C. 169; from whence it appears that the quadrienniums so termed were disposed in the order which they occupy in the Julian Period, as derived from the year as reformed by Cesar. To this example another is added, which is founded on an emendation of the text of Censorinus, as corrected from Pliny, and from which, if admitted, a like result follows—that from the reign of Servius Tullius to that of Vespasian, evidence occasionally appears of the succession of lustrums having conformed to the common order of the quadrienniums in the Julian Period, although great license was used in departing from it on particular occasions.

3. In the third and last division of his inquiry the author proceeds, from determining *the year*, to ascertain *the day* of the intercalation, which, as falling in the Julian year on the 6th of the calends of March, corresponding with February 24, has acquired, from its being repeated at the end of the quadriennium, the name of bissextile.

After premising that by the sun's entrance into one of the tropes, or cardinal points—the natural place of the intercalation

is indicated, the year finding in one of those points a natural beginning, which is regularly computed from the intercalary day by which it is immediately preceded—the author proceeds to show that the intercalation could not have been thus suggested, or have been originally coincident with the sun's ingress into one of those points which divide the year into seasons. This position he proceeds to prove by contrasting the time of the intercalation, as received from tradition, with that of the equinox as occurring between the extreme dates of the construction of the Egyptian calendar, B. C. 1711, and of the Roman, B. C. 45. Within that period, in which the intercalation occurred at the close of February, the equinox traversed from April 6 to March 24, according to the computation of these dates by the Julian year anticipated. Having shown that the same conclusion must be formed of the four tropes of the year, as identified by Sosigenes with the 8th of the Kalends of April, July, October, and January, whereas the intercalation was fixed for the 6th of the Kalends of March, it is thence decided that it could not have originated from any such coincidence.

The author, following up a suggestion of Eudoxus, preserved by the astronomer Geminus, by which the natural division of the year by the tropes is associated with the festival of the Isea, thence assumes that it discloses the probable grounds on which the day of the intercalation was chosen. After investigating the day on which the festival was held, and reducing the date of it, in the vague year of the Egyptians, to the coincident date of the Julian, he determines that in the year B. C. 1904, to which the epoch of the Egyptian calendar must be referred, the Isea fell on February 26. From this extraordinary coincidence in that remarkable year, he concludes that it discloses the original day of the intercalation, and the grounds on which it was chosen by the Egyptians. He thence takes occasion to prove the conformity of the festival with the time of the harvest in Egypt, at which it was

observed; and, by making a necessary allowance for the difference between the state of agriculture in those primitive times and the present, and between the productiveness of the climate in Upper and Lower Egypt, he proceeds to account for the difference of about 14 days, by which the ancients and moderns appear to have disagreed in the time of keeping harvest, as determined from the vernal equinox, which it has preceded about 24 days in all ages.

In confirmation of his views on this subject, the author refers to two Egyptian memorials, one of which is contained in the ancient hieroglyphic ritual, and the other in the circular zodiac of Tentera, which is at present in Paris. From the one he deduces an evidence that the division of the quadriennium, by the entrance of the sun into one of the tropes, was recognised by the ancient Egyptians, the diurnal and nocturnal ingress being expressed by a significant hieroglyphic. From the other he shows that the remarkable epochs when the great festival of Isis, in the retrogression of the great canicular year, coincided with those points of the horizon from whence the seasons take their beginning, were no less plainly expressed and happily indicated.

In proceeding from the consideration of the Egyptians to that of the Greeks, the author commences by observing the differences which arose from the substitution of lunar cycles for solar in the equating of the civil year to the latter. After premising that the reconciliation of those differences is to be sought at the close and commencement of the cycles, where the equation to solar time was applied, he proceeds to show that at these points they give sufficient indication of having been formed or deduced from years which preserved the original intercalation. He exemplifies this assumption in the ancient tetraeteris which had preceded the lunar cycles in Greece, and he establishes it from that of Solon and Cleostratus, which began on February 18; and was thus equated in the proper year and month, and within a few days of the original and



proper intercalation. Having thence taken occasion to explain and account for the departure of Meton and Calippus from the ancient practice, in their endeavour to render their cycles conformable to the lunar revolutions and first year of the Olympiad, he produces evidence from the ancient Delphic quadriennium, and the Pythiads, which took the intercalation on February 27, that as inquiry is carried back to remote ages, the evidence increases that such was the original and proper day of the intercalation.

In the practice of the Romans, which the author considers in its order, there are fewer difficulties; the intercalary day having been identified with February 24 in the reformation of the calendar by Cæsar, who in his choice of that day adhered expressly to ancient immemorial usage. Some diversities in the choice of the day, in which the Pontiffs were allowed and exercised a discretion, are then explained; and the consequent irregularities to which they gave rise in the year of confusion which called for the correction of Augustus, are described in order; and the exceptions, so far from weakening the general conclusion, serve to establish it, and confirm the assumption that the original day of the intercalation was preserved in Cæsar's reformation.

From the consideration of the fixed year of the Egyptians, generally known as the Alexandrian, a like inference is drawn. As a continuance of the ancient or vague year,—it necessarily took its beginning from the day on which the old year which it superseded ended. Although, in compliment to Augustus, the neomenia was chosen from the month of August, to which he gave its name, the intercalation was effected in the simplest manner, and that least likely to disturb the order which enjoyed so ancient a prescription. In its transfer from the middle to the beginning of the first year of the new era, it retains some evidence of the day of the intercalation having originally fallen on or near February 25. Such was the date of the month Phamenoth 1st, by which the Egyptian year is

precisely divided ; and from which the intercalation was transferred to Thoth 1st, with which the new year always commenced in Egypt.

A like inference is deduced from the era of Nabonassar, as having its neomenia coincident with February 26, the concurrence of that day with the time of the intercalation having led, amongst other causes, to its institution. The assumption derives confirmation from the Tentera zodiac to which we formerly alluded, and which was discovered in a temple that appears to have had its foundation determined by the rising of Sirius, as observed by the eye when directed along its walls to the horizon. In the coincidence of so remarkable a phenomenon with the day of the intercalation, a sufficient cause for the erection of the temple at the celebrated era appears to be suggested. And the supposition derives no inconsiderable support from the monument raised in it ; which, in the position assigned on it to Isis, in connexion with the cardinal points, marks out the precise time at which the temple was founded.

The last instance adduced by the author, in support of his theory of the ancient year, is taken from the calendar of the Mexicans, which serves less to prove its antiquity than its extensive adoption. It appears that at the time their country was discovered they had acquired a just notion of the length of the year, having been accustomed to compute the course of time by quadrienniums, exactly corresponding with the Julian, and, what appears truly astonishing, having the intercalation coincident with February 25, as in the Roman calendar. And this custom, which was accompanied with superstitious and barbarous rites, that prove it to have been derived from a different source than the Roman, we are assured on the highest authority, was common to all the polished nations of Anahuac, among whom the Mexicans were the principal.

After producing some concessions from the advocates of the ancient year consisting of 360 years, by which their opposition to the author's theory of an ancient year properly inter-

calated is neutralized, he brings his investigation to a close, in offering some remarks on the merits and usefulness of the Julian Period. Having so far established the antiquity, order, and intercalation of the quadrienniums, on which the year used by the nations that rank as classical is founded, he asserts their perfect conformity, in all essential points, to those incorporated in that great scale which has conferred such inestimable benefits on chronologists; and that, while it removes from them the reproach of measuring by a rule of which the dimensions are vague and indeterminate, furnishes them with an instrument by which the nicest computations may be made, and the most extraordinary discoveries effected.

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On a Babylonian Tablet in the British Museum, by the Rev. Edward Hincks, D. D.

This paper contains a copy of a Babylonian tablet, of which the following is given as the translation:—"On the sixth day of the month Nisan, the day and the night were equal. Six intervals were the day; six intervals were the night. May Nebo and Marduk draw near (i. e. be gracious) to the king, the lord." Every word in the inscription is examined separately; and its reading in most instances, and its translation in all instances, are given. The *intervals* spoken of, each of which was equal to two of our hours, are shown to have been marked by the running out of water or sand; the root from which the word signifying such an interval is derived having the meaning "to fail." In the course of the paper the Babylonian ordinal, collective, and cardinal numbers are treated of, and the linear measures; various errors on these subjects being pointed out. In conclusion, the absence of a date for the year is accounted for by the supposition that the tablets of each year were placed in a compartment with wooden sides and bottom; which having decayed, the tablets fell to the ground and were mingled and broken. The date of the equinox recorded is shown to have been on the 27th March,